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February 1, 2016

Dr. Anne Hollowed
Alaska Fisheries Science Center
7600 Sand Point Way, NE
Seattle, WA 98115

Re: CIE Review of the EBS and AI Pacific cod stock assessment models: FLC comments

Dear Dr. Hollowed and CIE Review Panel,

Please accept the following public comments for consideration during the CIE review of the AI and EBS p-cod stock assessment models.

The FLC represents the owners and operators of over 30 U.S.-flag vessels that participate in the freezer longline sector of the Pacific cod fishery in the Bering Sea and Aleutian Islands. FLC member vessels range in size from approximately 110 to 185 feet. The mission of the FLC is to promote public policy that facilitates the sustainable and orderly harvest of Pacific cod and other groundfish species. All members of the FLC who participate in the BSAI Pacific cod fisheries are also members of the Freezer Longline Conservation Cooperative (FLCC), a voluntary cooperative established in 2010. The mission of the FLCC is to sustainably manage the quota allocated by the Council to the freezer longline sector of the BS and AI Pacific cod fisheries. FLCC and its members work collaboratively with NMFS to ensure the efficient and responsible harvest of the Pacific cod quota allocated to the sector, including maximizing optimum yield in the fishery and minimizing bycatch of other species.

Thank you for your consideration of these comments.

Sincerely,

A handwritten signature in blue ink, appearing to read "C. See", is positioned above the printed name of the signatory.

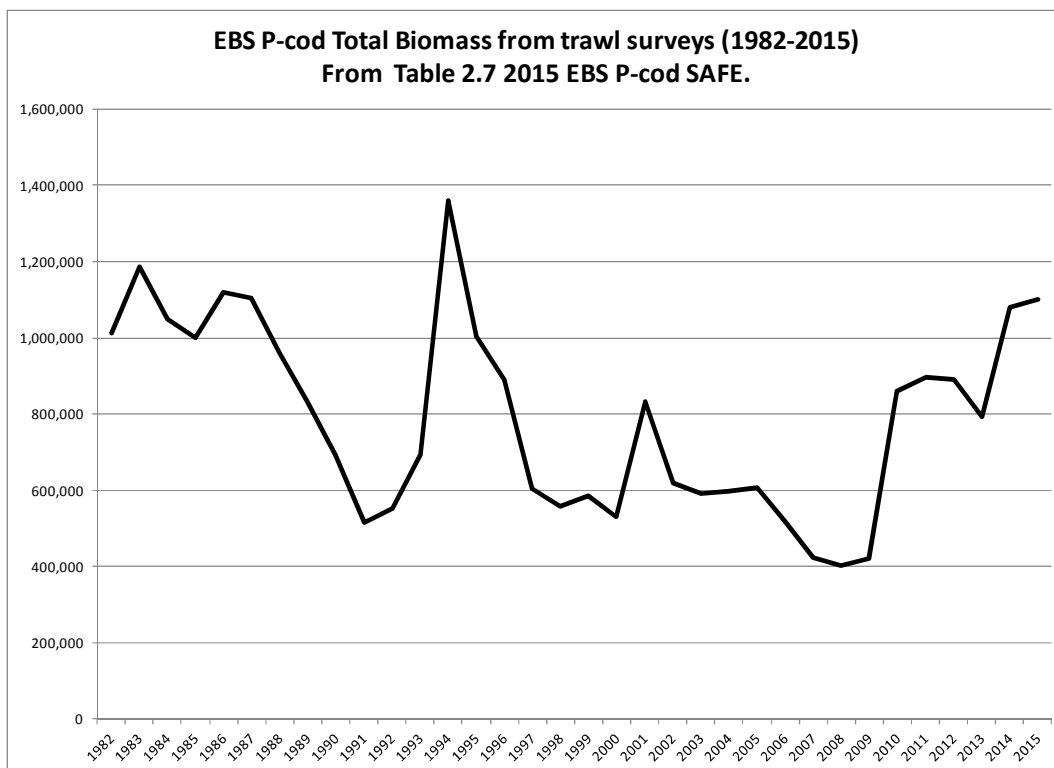
Chad I. See
Executive Director
Freezer Longline Coalition

Model Validation: The members of the FLC have significant long-term investments in the EBS and AI p-cod fisheries. While the FLC is interested in all aspects of model development and review, one major area of interest is model validation, i.e. does the model (and output) correspond with the actual performance and conditions of the stock. Members of the FLC have up to thirty-five years of experience in the hook-and-line p-cod fisheries of the BSAI. Accordingly, the FLC has an interest in model output that is reasonably consistent with what the fleet is experiencing on the water.

Retrospective Bias and Stock Status: EBS Model 11.5 has a retrospective pattern where the estimate of modeled abundance is subsequently revised downward after additional years of data are added. This would imply that the stock may been subject to a higher fishing mortality (F) than previously thought. The concern is whether the retrospective bias would result in potential overfishing. However the stock status of the EBS p-cod stock is quite healthy and does not suggest that any overfishing has occurred. In contrast, the stock has been increasing since 2008.

Figure 1: EBS Trawl Survey Biomass: The 2015 trawl survey biomass is the highest since 1994 and the fourth highest from 1982 to 2015. Survey biomass has been increasing since 2008.

“Estimated biomass more than doubled between 2009 and 2010, then remained relatively stable for the next three years, followed by another large increase (36%) in 2014.”¹



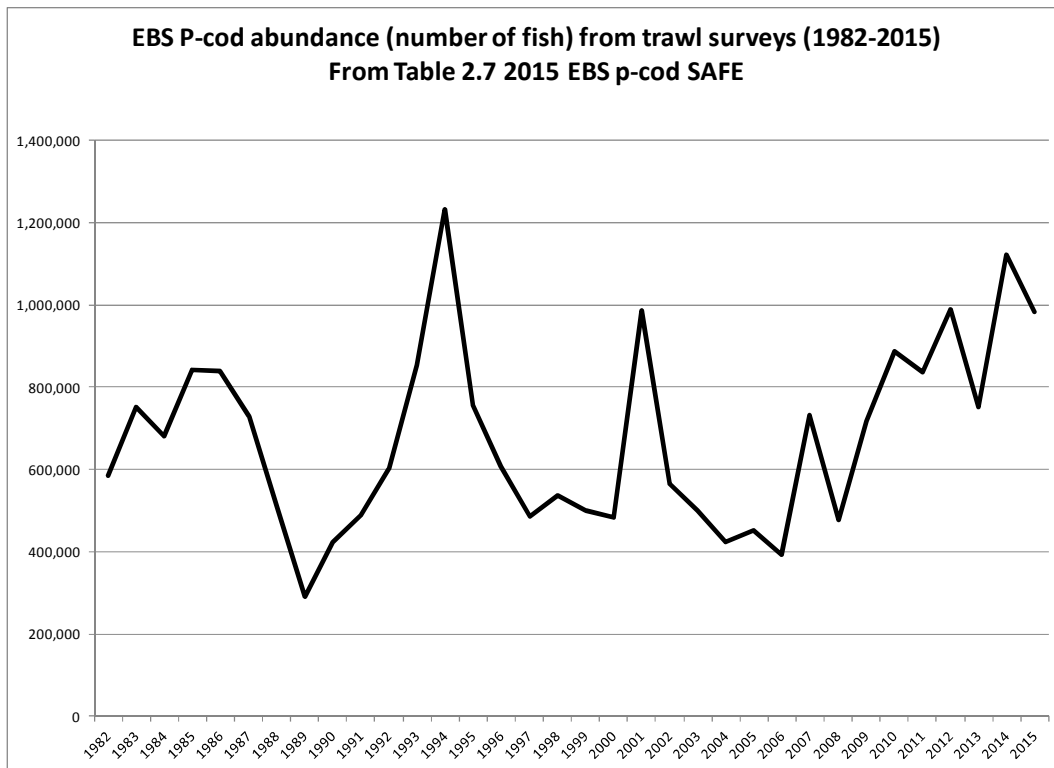
¹ P. 8, 2015 EBS P-cod SAFE

SSC minutes, Dec 2015: *“Both models predict increasing biomass due to a number of strong year classes during the recent cold period. The estimated 2015 survey biomass was slightly lower than in 2014 but near the upper end of the range of values observed since 1977. The increases appear to be reliably estimated because several strong year classes are seen entering the fishery. Based on projections, biomass is expected to increase further in the near future.”*

Spawning biomass: The 2016 estimate for spawning biomass (modeled) is the highest since 1991 (Table 2.25, p. 85, 2015 EBS P-cod SAFE). *“Both models suggest that spawning biomass has been increasing steadily since 2009 or 2010.”²*

Figure 2: Trawl survey abundance (N): (Table 2.7, p. 52, 2015 EBS P-cod SAFE)

- 2014 is the second highest abundance in the time series (1982-2015).
- Abundance has been steadily increasing since 2007.
- The most recent five year average (2011-2015) is **+46%** higher than the previous five year average.
- The most recent ten year average (2006-2015) is **+38%** higher than the previous ten year average.



² P. 22, 2015 EBS P-cod SAFE

Recruitment (Table 2.26, p. 86, 2015 EBS P-cod SAFE).

- The three largest age classes from 1982 to 2014 are 2008, 2011, and 2013.
- 2006, 2010, and 2012 are also large above-average age classes.
- The most recent five year average (2010-2014) recruitment is **+36%** higher than the previous five year average.
- The most recent ten year average (2005-2014) recruitment is **+82%** higher than the previous ten year average.
- *"In the present assessment, spawning biomass is estimated to be well above B40%, and is projected to increase further. These increases are fueled largely by the **2006, 2008, 2010, and 2011** year classes, whose strengths have now been confirmed by multiple surveys. The **2013 year class also appears to be strong**, although this result is highly preliminary, being based entirely on the results of the 2014 and 2015 surveys."*³

Catch-per-unit-of-effort (CPUE): (Table 2.6, pp. 49-51, 2015 EBS P-cod SAFE). The EBS p-cod fishery is prosecuted by trawl, pot, longline, and jig gear. CPUE "units" in Table 2.6 are kg/minute for trawl gear, kg/hook for longline gear, and kg/pot for pot gear. The trend in CPUE by all gear types is increasing (2001-2015). [See Appendix A for CPUE by gear type and season].

- **Trawl CPUE "A" season:** increasing
- **Trawl CPUE "B" season:** increasing
- **Trawl CPUE "A" season:** increasing
- **Pot CPUE "A" season:** increasing
- **Pot CPUE "B" season:** increasing
- **Longline CPUE "A" season:** stable to increasing
- **Longline CPUE "B" season:** stable to increasing

Stock Status Summary:

- **The biomass and abundance from the trawl survey (not model) have been increasing since 2008.**
- **Strong age classes: 2006, 2008, 2010, 2011, 2013.**
- **CPUEs have been stable to increasing.**

"Q": Trawl Survey Catchability

The archival tag study (Nichol 2007) tested the distribution and proximity of p-cod to the trawl survey net. The number of data points is large (17,000), the number of tagged fish is small (11). The Nichol study indicates that larger cod (60-81 cm) are less vulnerable to the trawl survey. This resulted in a fixed Q of 0.77 (Model 11.5).

³ P. 30, 2015 EBS P-cod SAFE

A Q of less than 1.0 corresponds with the fact that the proportion of longer p-cod that are caught in the fishery is higher than the proportion in the survey. The summer trawl survey is then “missing” the larger p-cod, either due to:

- The larger p-cod are present – but are more capable of avoiding the trawl survey net (as in Nichol 2007), or
- The larger cod are not present on the shelf in the summer (and not available to the survey), or
- Both (and most likely a degree of both above factors).

There is some preliminary indication that some larger p-cod in the summer may be found further north in the Northern Bering Sea during the summer months (outside of the EBS survey area). The Northern Bering Sea is surveyed infrequently (last time was 2010) and that information has not been used in modeling. P-cod appears to be in a patchier distribution *“however, the NBS survey area did contribute significantly in the 71-95 cm range, accounting for 16-42% of the total in each of those bins [for the combined EBS and NBS].”*⁴

However, given that the fishery now operates year-round and catches larger p-cod than the survey, it is unlikely that all larger p-cod in the EBS move en masse out of the EBS into the NBS (i.e. some portion of large cod remains in the EBS).

The “missing” large p-cod in the survey seems to support a Q of less than 1.0 (and certainly does not support a Q of 1.06 as was estimated internally in Model 14.2).

Maunder, 2011: *“More archival tagging is needed to improve the estimates of catchability and understand how catchability changes over time. The survey data should be analyzed to determine if prey species abundance is correlated with the cod catch (or catchability deviates). For example, years with high abundance of crab may mean that cod are feeding more often on the bottom and are therefore more vulnerable to the survey trawl gear that has a low head rope. Survey studies comparing the current survey gear with survey gear with a higher head rope would provide information about catchability and how it changes over time and space.”*⁵

Model Diagnostics: Maunder: *“The index that should be used as a diagnostic to double check the reasonableness of the ABC is the catch divided by the survey abundance in the previous year. This should be compared with ABC divided by the survey biomass in the previous year. If any model’s ABC estimate is inconsistent with this index, then the model is questionable. The index could be improved by taking the fishery selectivity and fish growth into consideration.”*⁶

⁴ P. 9, 2015 EBS P-cod SAFE

⁵ P. 12, Maunder 2011, FLC Submission to CIE

⁶ Maunder, 2015

Appendix A: Figure 1: Trawl CPUE trends for “A” season Jan/Feb and March/April (2001-2015)

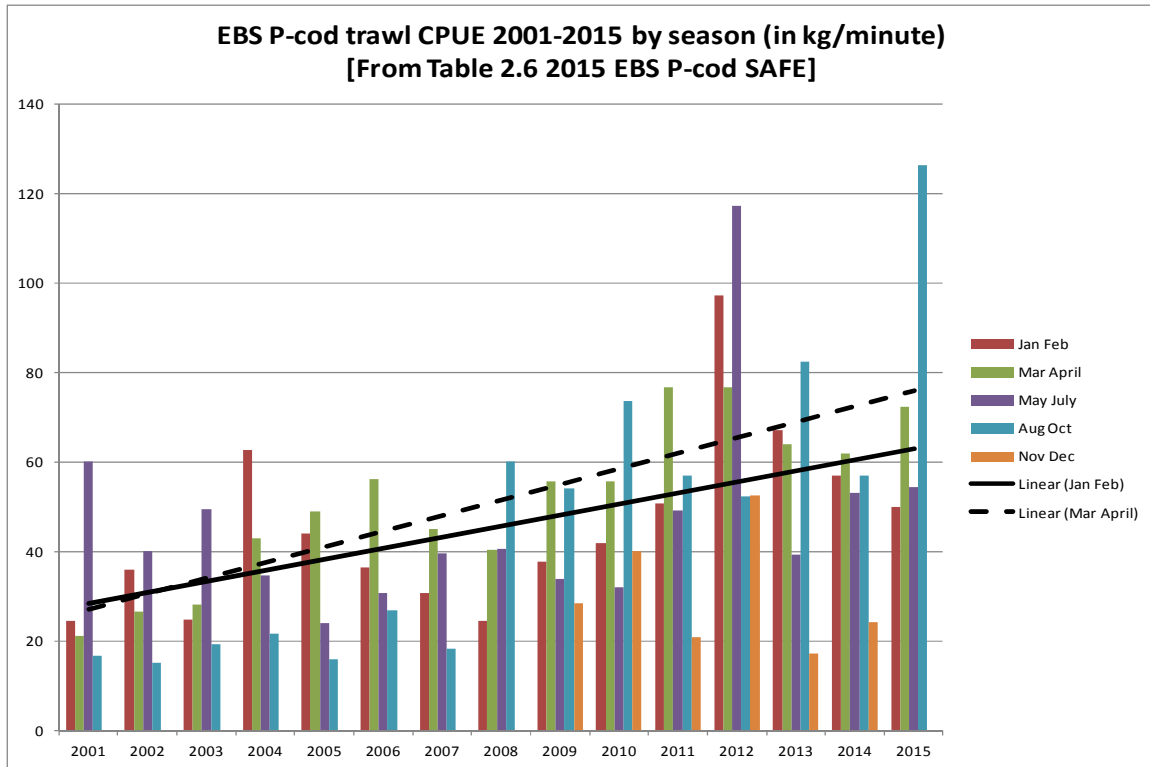


Figure 2: Trawl CPUE trend for “B” season Aug/Oct only (for 2001-2015)

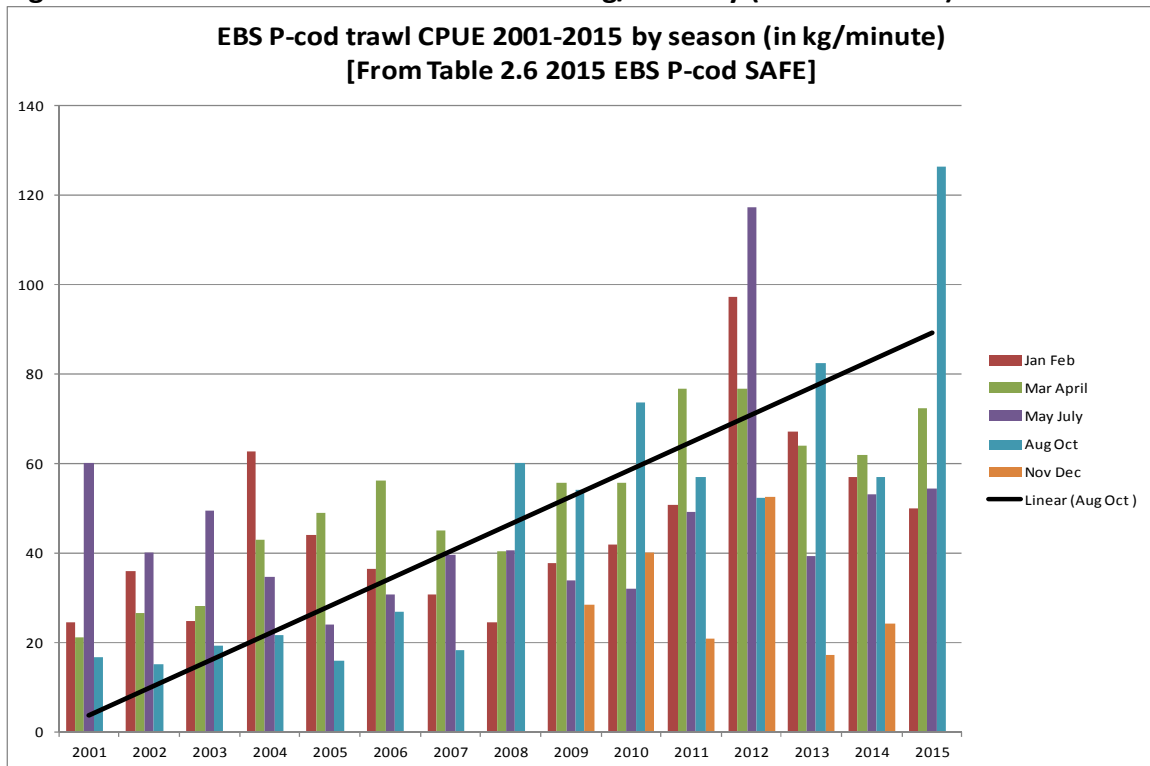


Figure 3: Pot CPUE trends for “A” season Jan/Feb and March/April (for 2001-2015).

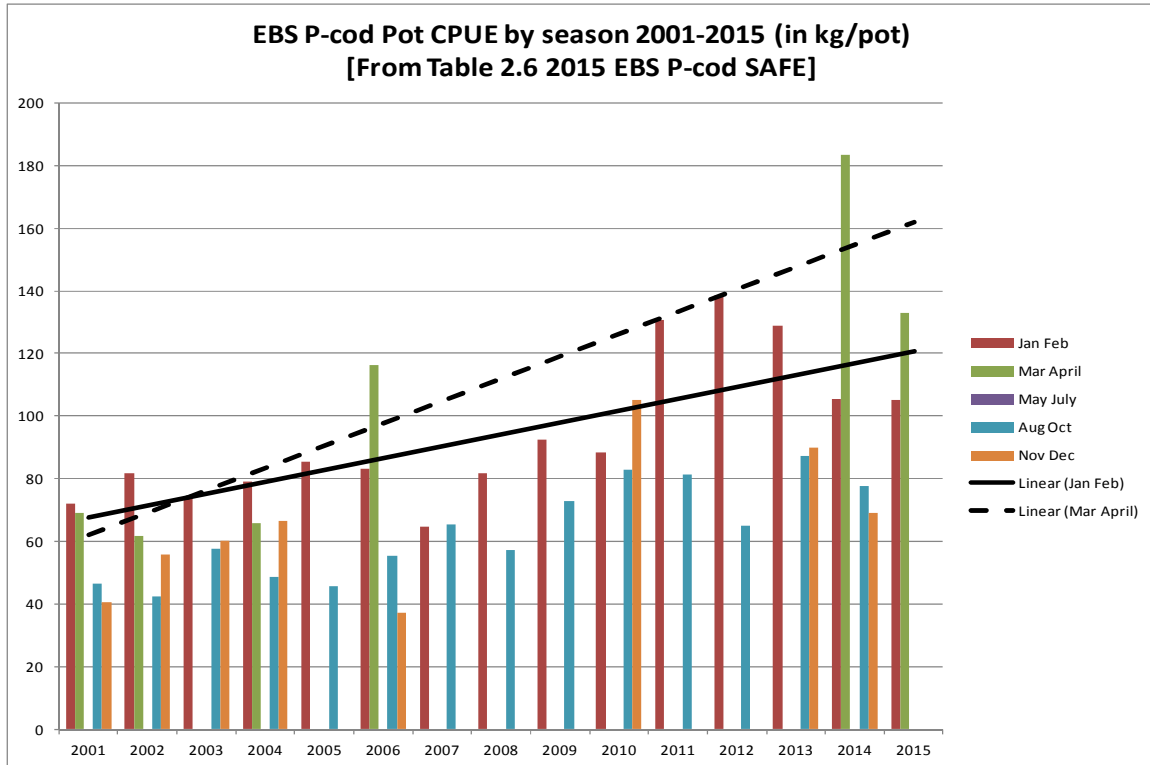


Figure 4: Pot CPUE trend for “B” season Aug/Oct only (for 2001-2015)

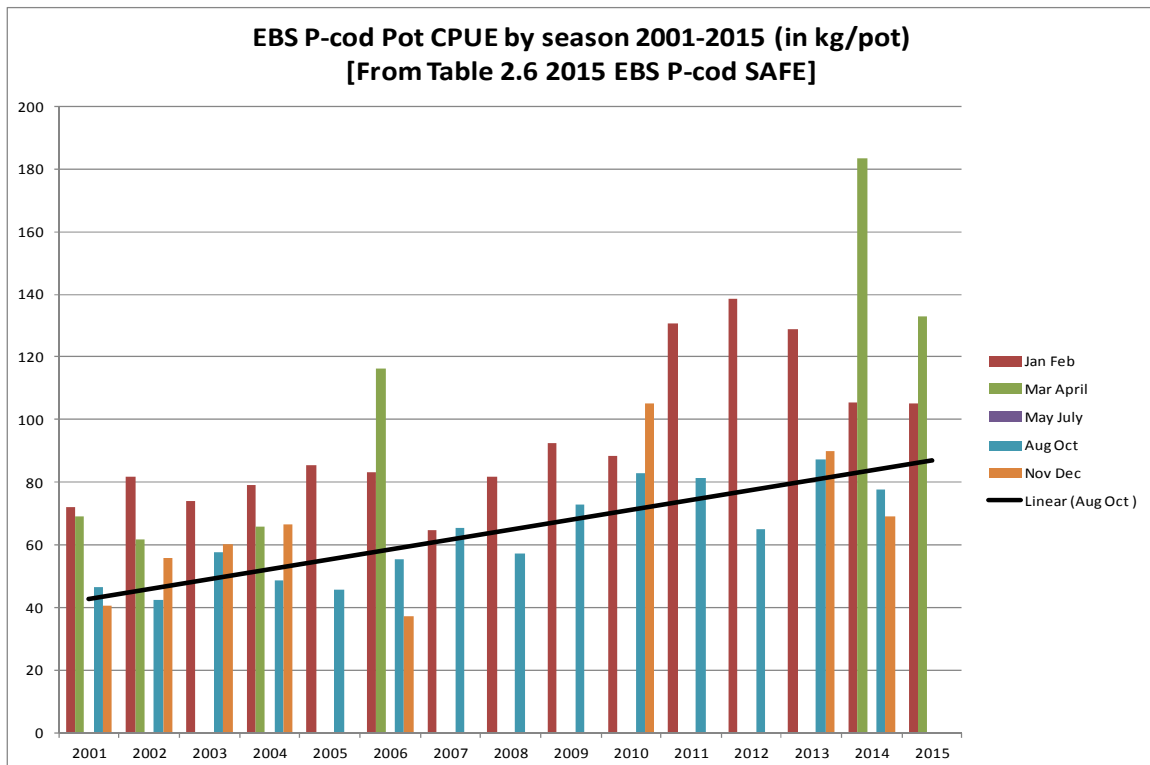


Figure 5: Longline CPUE trend for “A” season Jan/Feb and March/April (for 2001 to 2015)

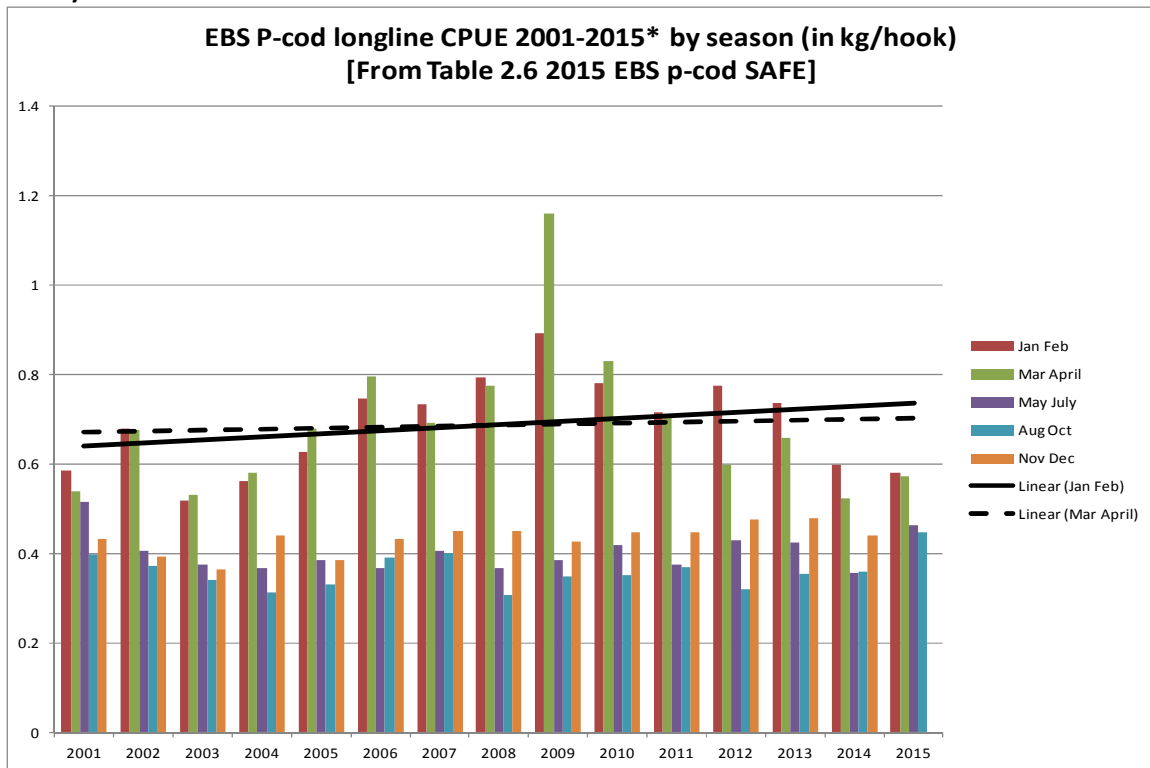
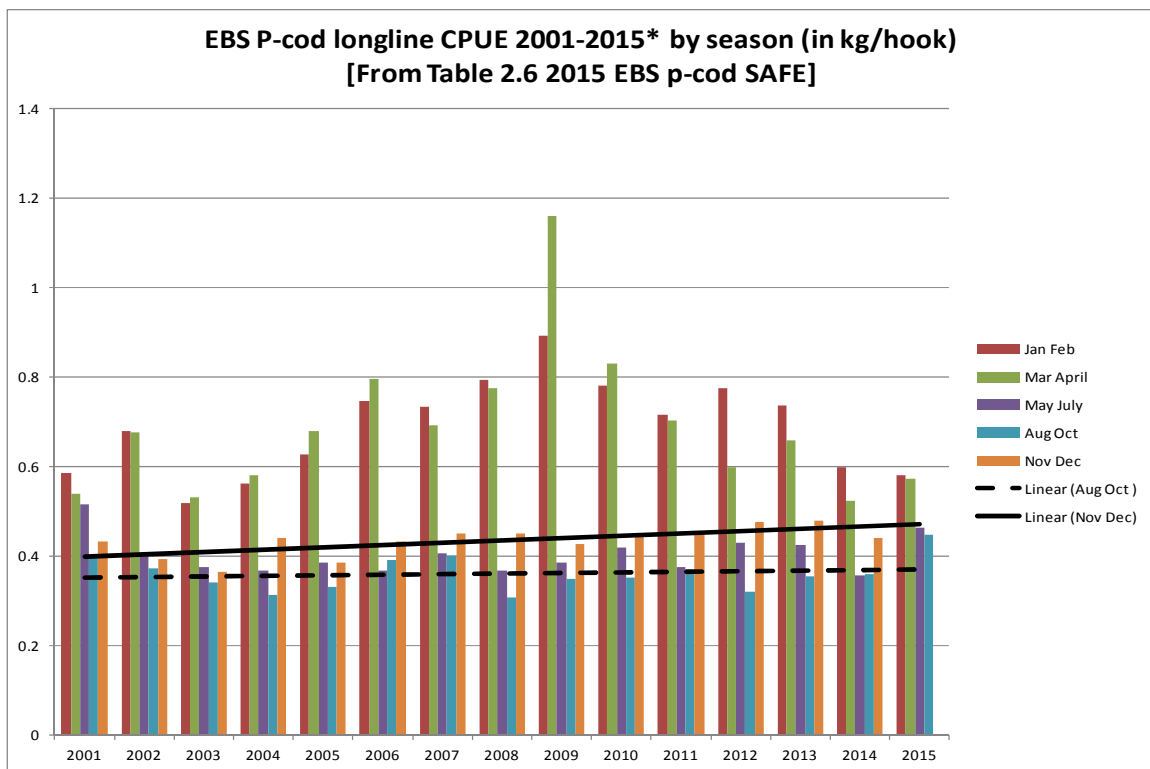


Figure 6: Longline CPUE trend for “B” season Aug/Oct and Nov/Dec 2001-2015



Longline CPUE: The longline CPUE trends are flatter than the pot and trawl gear CPUE trends. This is due to the fact that the longline CP sector p-cod sector was voluntarily rationalized in 2010 (and the other gear types are not – for BSAI p-cod). As a result of coop formation, the seasonal timing of the CP longline fishery changed significantly (as of the second half of 2010 “B” season).

Formerly, the directed p-cod CP longline season was focused in Jan/Feb and August/Nov (periods of higher CPUE). With rationalization, the fishery now occurs year-round and with a reduced number of vessels on the water (from 36 vessels in 2001 to 30 in 2015). A number of older vessels are being replaced (and it is more efficient to run one boat year round than two boats for a half year each).

As a result of fishing a longer season, more fishing now occurs in months with somewhat lower CPUEs (in comparison to the competitive fishery). The trend in longline CPUE is more reflective of the change in management than stock status. More hooks are being run in months with lower CPUE since rationalization. The trends in the pot and trawl gear p-cod fisheries are a more accurate reflection of EBS p-cod stock status. The trends in pot and trawl CPUE correspond with the increases in p-cod biomass seen in the EBS trawl survey.

- Pre-2010, the EBS CP longline fishery was limited access (LLP with endorsement) but was a very competitive fishery (with no individual vessel catch share apportionment). There was (and is) a seasonal apportionment of EBS p-cod harvest (from SSL management measures) that limits the allowable harvest in the “A” season (Jan-June).
- The “A” season has higher CPUEs than the “B” season. Jan/Feb has the highest CPUE, followed by March/April, then Nov/Dec, and Aug/Oct. May/July has the lowest CPUE. (Table 2.6, p. 50, 2015 EBS P-cod SAFE).
- In **2001**, the non-CDQ “A” season lasted from Jan 1 to March 25th. In **2005**, the non-CDQ “A” season was from Jan 1 to February 22nd. By **2009**, the non-CDQ “A” season was only January 1 to February 6th. At the same time the “B” season was also shortening (see Table 1). CDQ p-cod (Community Development Quota) is 10.7% of the EBS TAC. Prior to 2010, this fishery was conducted after the directed fishery closed.
- Post 2010, with the formation of the cooperative, the fishery is now on year-round basis (including months with lower CPUEs). CDQ p-cod fishing now occurs throughout the entire year.

Table 1: Season length in the CP H&L EBS P-cod fishery (non-CDQ_

Year	"A" season: 1/1 to closure date	"B" season: 8/15 to closure date
2001	March 25	December 12
2002	March 8	November 25
2003	March 15	December 9
2004	March 13	December 10
2005	February 22	December 12
2006	February 18	October 2
2007	February 12	October 2
2008	February 8	November 7
2009	February 6	November 16
2010	February 9	
	Coop formation	
2010		Open entire "B" season
2011	Open entire "A" season	open
2012	open	open
2013	open	open
2014	open	open
2015	open	open